WHAT IS CLAIMED IS:

1. A method of making interferometric measurements of an object, the method comprising:

generating an input beam that includes a plurality of component beams, each of which is at a different frequency and all of which are spatially coextensive with each other, some of the components beams having a first polarization and the rest having a second polarization that is orthogonal to the first polarization;

deriving a plurality of measurement beams from the plurality of component beams, each of said plurality of measurement beams being at the frequency of the component beam from which it is derived;

focusing the plurality of measurement beams onto a selected spot to produce a plurality of return measurement beams;

combining each of the return measurement beams of the plurality of return measurement beams with a different corresponding reference beam of a plurality of reference beams to produce a plurality of interference beams; and

acquiring a plurality of electrical interference signal values for the selected spot from the plurality of interference beams.

2. The method of claim 1, wherein acquiring the plurality of electrical interference signal values involves, for each of the plurality of acquired electrical signal values, introducing a different combination of phase shifts between the return measurement and reference beams that produce each of the interference beams of said plurality of interference beams.

3. The method of claim 1, wherein each of the plurality of electrical interference signal values contains information simultaneously about both fields of two orthogonally polarized beams coming from the selected spot.

4. The method of claim 1, wherein each of the plurality of electrical interference signal values contains information simultaneously about both conjugated quadratures of

each field of the two orthogonally polarized beams scattered, reflected or transmitted by the object at the selected spot.

5. The method of claim 1, wherein the detector assembly includes a detector having a sensitivity that is characterized by a frequency bandwidth and further comprising using frequencies for the plurality of component beams that separated from each other by at least an amount that is greater than the frequency bandwidth of the detector.

6. The method of claim 1, wherein the plurality of component beams includes an equal number of beams at each of said first and second polarizations.

7. The method of claim 6, wherein the plurality of component beams includes two beams having the first polarization and two beams having the second polarization.

8. The method of claim 6, wherein the plurality of component beams equals four beams having the first polarization and four beams having the second polarization.

9. The method of claim 2, wherein introducing a different combination of phase shifts between the return measurement and reference beams that produce each of the interference beams of said plurality of interference beams involves introducing various frequency shifts into the frequencies of the beams of the plurality of component beams.

10. The method of claim 2, wherein the combining involves generating a plurality of interference beams that are coextensive in space and the method further involves focusing the plurality of interference beams onto a single detector element.

11. The method of claims 10, wherein acquiring said plurality of electrical interference signal values from the plurality of interference beams involves acquiring eight electrical interference signal values.

12. The method of claim 1 further comprising from the plurality of acquired electrical interference signal values computing information about fields of orthogonally

polarized beams that are scattered, reflected, or transmitted by the object at the selected spot.

13. An interferometry system for making interferometric measurements of an object, said system comprising:

a beam generation module which during operation delivers an output beam that includes a first set of beams having a first polarization and a second set of beams having a second polarization that is orthogonal to the first polarization, wherein all of the beams of the first and second sets of beams are at a different frequency and within the output beam are coextensive in space, said beam generation module including a beam conditioner which during operation introduces a sequence of different shifts in a selected parameter of each of the beams of the first and second sets of beams, said selected parameter selected from a group consisting of phase and frequency;

a detector assembly; and

an interferometer constructed to produce from the output beam a first set of measurement beams having the first polarization and a second set of measurement beams having the second polarization, said interferometer further constructed to image both the first and second sets of measurement beams onto a selected spot on the object to produce therefrom corresponding first and second sets of return measurement beams, and to combine the first and second sets of return measurement beams with a plurality of corresponding reference beams to produce a first and second set of interference beams and simultaneously image the first and second sets of interference beams onto the detector assembly.

14. The interferometry system of claim 13, wherein the measurement beams of the first and second sets of measurement beams are coextensive in space and share the same temporal window function.

15. The interferometry system of claim 13, wherein the beam conditioner by introducing the sequence of different shifts in the selected parameter of each of the beams introduces a different combination of phase shifts between the return measurement and

reference beams that produce each of the interference beams of said plurality of interference beams.

16. The interferometry system of claim 13, wherein the detector assembly includes a detector element onto which the first and second sets of interference beams are simultaneously focused to generate an electrical interference signal value, wherein the electrical interference signal value contains information simultaneously about both fields of two orthogonally polarized beams coming from the selected spot.

17. The interferometry system of claim 16, wherein the electrical interference signal value contains information simultaneously about both conjugated quadratures of each field of the two orthogonally polarized beams scattered, reflected or transmitted by the object at the selected spot.

18. The interferometry system of claim 13, wherein the detector assembly includes a detector having a sensitivity that is characterized by a frequency bandwidth and wherein the frequencies of the beams of the first and second set of beams are separated from each other by at least an amount that is greater than the frequency bandwidth of the detector.

19. The interferometry system of claim 13, wherein the first and second sets of beams each includes two beams.

20. The interferometry system of claim 13, wherein the first and second sets of beams each includes four beams.